CATKIN-BEARING PLANTS

GILBERT-CARTER

A.R. Clapham

OUR CATKIN-BEARING PLANTS

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×POPULUS SEROTINA Hartig, Black Italian Poplar (p. 9), on the bank of the Cam at Grantchester. The commonest poplar in Britain. The fan-like crown distinguishes it from all our other trees.

OUR CATKIN-BEARING PLANTS

AN INTRODUCTION

BY

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H. G.-C.

PREFACE

THIS little book has two purposes. First it is designed to give a short systematic account of our catkin-bearing trees, which are not properly described in the Floras available to students. No one realized the extent to which the study of our native trees had been neglected until the appearance in 1914 of volume 2 (the first volume to be published) of the *Cambridge British Flora*.

Its second purpose is to give teachers the benefit of some of the experience I have gained during my elementary courses of instruction at Cambridge.

During the Cambridge 'Long Vacation Term', which lasts from the beginning of July to the middle of August, I give on an average two and a half lectures a week on Systematic Botany. Most of these lectures are followed by a Practical Class or a Demonstration. The best part of one whole day and of one or two evenings a week is devoted to work in the field.

The students taking the course are also hearing lectures on Ecology, and most of the time in the field is devoted to this study.

During the Practical Classes my first care is to teach the students how to use a Flora. The only Flora of this country fit to be put into the hands of a learner is Hooker's *Student's Flora of the British Islands*. The chief defects of this book arise from the fact that its last edition was published as long ago

as 1884. Some of the information in it, especially that about the catkin-bearing trees, is incomplete and out of date.

By studying the material collected on excursions in Hooker's *Student's Flora* much will soon be learnt about families whose flowers are conspicuous; but, because of the tendency to neglect plants with inconspicuous flowers, a distorted view of the British Flora will be gained. Most of the students have begun the study of Botany in the winter and have acquired the habit of sitting at a bench and examining and drawing fragments of plants. They do not know how to contemplate an entire plant, and consider the union of petals and the number of stamens of greater moment than whether they are dealing with an annual herb or a lofty forest tree. It is to trees they must turn for the training their eyes need. They must learn to appreciate the gross features of the bark and branching before examining the details of the twigs and flowers. I recently asked a student the difference between the *Ranunculaceae* and the *Magnoliaceae*. He did not know, and began talking about the stamens. I asked him whether he had ever eaten a buttercup. He replied: 'Yes, it tasted very hot.' He did not happen to have sampled the bark of a *Magnolia*, but I told him that it was aromatic. The kind of answer I wanted was: 'The *Ranunculaceae* are acrid herbs: the *Magnoliaceae* are aromatic trees and shrubs.' To that student, now that he has tasted the bark of *Magnolia stellata*, it is no mere book knowledge that in classifying the *Ranales* the presence or absence of volatile oils is

of importance. Such students for the time being must put aside their stamens and carpels, and begin to learn the lessons that many of them in a few years will learn from practical men, so-called 'natives', ignorant of our science. They must, moreover, acquire a knowledge of plants that will overcome their fear of them. On my excursions new students have often expressed surprise or even misgiving at seeing me pick the young leaves of *Malva silvestris*, and place them between the layers of my bread and cheese. The blandness and richness in mucilage of the *Malvaceae* should be taught before their monothecous anthers. Few organisms can resist the temptation of *Malvaceous* foliage, as the cotton grower knows only too well. As soon as his plants are in the ground the news seems to spread to every insect in the district. It is an interesting fact that the characters that give plants relationship to man are often of classificatory importance, and it is a fact that cannot be too early impressed upon students.

A word about Hooker's *Student's Flora*. Students often complain that this book contains too many technical terms. As a matter of fact its terminology is, to use Hooker's own words, 'as simple as is obtainable with due regard to precision of language'. It is a mistake to suppose that Hooker used a great many technical terms in this book. After spending one or two hours of my Practical Classes in reading several pages of the Flora and explaining carefully the exact meaning of the terms used, I find that few words remain which students do not understand.

In this little book I have added foot-notes explain-

ing the meaning of plant names. Much in these notes should have been learnt at school, and ought to be second nature to a University student. The ignorance of Latin and indeed of English and of all that should be fundamental in education increases yearly amongst students of science. It should be the duty of a teacher to check the facility with which students learn words of whose meaning they are entirely ignorant, a process comparable to swallowing flints, which are not only entirely indigestible, but which because of their relentlessness will set up lasting internal mischief.

The best of my students come to a Virgil reading class which I hold once a week. In this class I read with them one of the *Georgics*, indulging in frequent philological rambles. This is the most pleasant way of learning to know and to love Latin words.

Without some knowledge of Latin no Systematic Botany can be learnt. Indeed the Universities do little good and much harm in attempting to educate those who have no classical foundation on which to build.

I have made my foot-notes as short as possible, contenting myself with giving the bare meanings of the words as used by Botanists. Teachers should see that students know the meanings of the names by which plants are called. These names are often a help in discriminating the plants. The British species of *Bupleurum*, *Bidens*, *Convolvulus*, *Polygonatum*, and *Lemna* can be all distinguished from each other by their trivial names, if the meanings of these names are known. Such names as *Sagittaria sagitti-*

folia and *Myosurus minimus* speak for themselves. The lines from Virgil which I have included in the notes are chosen because their cadence enshrines words important for students to know. Poetry is more easily committed to memory than prose, and these lines are soon learnt by heart.

Moreover, by reading Latin verse the quantity of vowels becomes known. Those who mispronounce words are generally ignorant of their meanings. The student of to-day who lengthens and accents the *o* in *auricomus* has learnt the word like a parrot, neither knowing nor caring what it means.

There are several text-books of Systematic Botany; none is written on the only principle by which the attention of students can be arrested, the principle of the species. The species of Willow mentioned in this book are all discriminated by my best students after a single day's work. The account of *Salix* contains the notes of a lecture which occupies an hour. After the lecture I give a demonstration on a piece of land near at hand where willows abound, and in the evening I give another demonstration on a piece of ground not far from Cambridge. At the end of the day the species are known, and students may be heard discussing the parentage of hybrids which they have found.

They have now learnt to know these willows by examining and touching them where they grow. They think of them as plants, not as twigs, and are in a position to read detailed accounts of them in their text-books. It is not good for students to read characters of major groups of plants before they have

become acquainted in the field with some of the component species of these groups. The mind first conceives plants as individuals, then as species: the idea of the family follows later.

They are now in a position to see the lowland English landscape, which hitherto, because of their lack of knowledge, they thought uninteresting because flat. As soon as the outward form of the trees is known, our scenery becomes full of interest and beauty. To the rightly trained eye no one kind of scenery is more beautiful than another; though some kinds need more training than others for their appreciation. Here again the study of Systematic Botany and Virgil must go hand in hand:

principio arboribus varia est natura creandis.
namque aliae nullis hominum cogentibus ipsae
sponte sua veniunt camposque et flumina late
curva tenent, ut molle siler lentaeque genistae,
populus et glauca canentia fronde salicta.

Virg. *G.* ii, 9–13.

Firstly, Nature has many ways of producing trees. Some arise of themselves without man's aid, and far and wide overspread the plains and winding rivers, such as the soft Osier and the bending Broom, the Poplar and blueish thickets of Willows with their silvery foliage.

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BIBLIOGRAPHY

ASCHERSON-GRAEBNER: *Flora des Nordostdeutschen Flachlandes.* (Berlin, 1898–9.)
A bright gem in Europe's Diadem of Floras.

BEAN, W. J.: *Trees and Shrubs hardy in the British Isles.* (London, 1921).
Describes living trees; not dried twigs as they appear in the Herbarium.

ENGLER-GILG: *Syllabus der Pflanzenfamilien.* (Berlin, 1924.)
Contains the official statement of Engler's System.

HEGI, GUSTAV: *Illustrierte Flora von Mittel-Europa*, vol. 3. (Munich.)
The fullest flora ever written. Abounds in every kind of information about the plants described.

HUTCHINSON, J.: *The Families of Flowering Plants.* (London, 1926.)
In this book the *Ranales* are regarded as the most primitive dicotyledons, and the *Amentiflorae* as derived by reduction from the *Rosales.* Full of interest and of beautiful illustrations.

MOSS, C. E.: *Cambridge British Flora*, vol. 2 (Cambridge, 1914.)
This volume contains a detailed account of all our *Amentiflorae.*

VON WETTSTEIN, R.: *Handbuch den Systematischen Botanik.* (Vienna, 1924.)
This is the best text-book of Systematic Botany.

CONSPECTUS

THE plants in this book belong to the *Amentiflorae*, or first group of *Archichlamydeae* in Engler's system. The *Amentiflorae* here described are all woody plants except *Humulus* (Hop), *Urtica* (Stinging Nettle), *Parietaria* (Pellitory), and *Cannabis* (Hemp). All British woody *Amentiflorae* are deciduous, and have alternate leaves except *Salix purpurea*, whose leaves are sometimes opposite; some of the herbaceous species have invariably opposite leaves.

The British *Amentiflorae* may be defined somewhat like this:

> *Usually woody plants with alternate leaves. Flowers in catkins or much contracted inflorescences; perianth absent or green.*

The catkin, called in botanical Latin *amentum*, is more easily recognized than defined. It is typically a unisexual spike, ultimately falling as a whole, in the axils of whose densely packed usually imbricating bracts are situated single flowers ('simple catkin') or reduced dichasia ('compound catkin'). Typical catkins are cylindrical and usually pendulous. The perianth is absent or simple and bract-like. The word 'tepal' denotes a segment or member of such a perianth not differentiated into calyx and corolla.

It is not my purpose to discuss whether the flowers

of these plants are simple because they are primitive or because they are reduced. Engler, whose classification is here followed, believes that they are primitive, but there is much to be said in favour of the opposite view. The orders in question will be found in Group A of *Archichlamydeae* (Engler-Gilg, *Syllabus der Pflanzenfamilien*, eds. 9 and 10, p. 171). When students are able to recognize the plants they should read or have translated to them the interesting discussion on the origin of the angiospermous flower in Wettstein's *Handbuch der Systematischen Botanik* (pp. 515–37).

* *Woody plants with alternate leaves* (*except sometimes* Salix purpurea).

Order 1. **Salicales.** Leaves simple; stipules sometimes caducous. Catkins simple (one flower in the axil of each bract). Flowers dioecious. Perianth cup-like (*Populus*) or of yellow glands (*Salix*). Ovary unilocular. Fruit capsular; seeds with tufts of hairs. (Only family) SALICACEAE (p. 4)

Order 2. **Myricales.** Leaves simple, exstipulate, dotted with golden glands, fragrant when crushed. Catkins simple. Flowers apparently dioecious. Perianth absent. Ovary unilocular. Fruit a drupe (in our species two-winged and scarcely succulent).

(Only family) MYRICACEAE (p. 22)

Order 3. **Juglandales.** Leaves pinnate, exstipulate.

Catkins simple. Flowers monoecious. Perianth bract-like. Ovary unilocular.
(Only family) JUGLANDACEAE (p. 24)

Order 4. **Fagales.** Leaves simple; stipules (bud-scales) usually caducous. Catkins simple or compound. Flowers monoecious. Perianth bract-like or absent. Ovary inferior with two or more loculi.

Styles 2. Cupule of fruit absent, or (in *Corylus*) leafy. BETULACEAE (p. 27)

Styles 3–6. Cupule of fruit scaly or prickly.
FAGACEAE (p. 35)

** *Woody or herbaceous; leaves in some of the herbs opposite.*

Order 5. **Urticales.** Leaves simple, usually scabrous. Inflorescence often much contracted. Perianth bract-like or absent.

Woody plants with watery juice. Leaves pinnately nerved. ULMACEAE (p. 44)

Herbs or twiners with watery juice. Leaves palmately divided or nerved.
CANNABACEAE (p. 59)

Herbs with watery juice. Leaves pinnately nerved.
URTICACEAE (p. 56)

Woody plants with milky juice. MORACEAE (p. 52)

The *Garryales* (only family *Garryaceae*), distinguished from all the above by their opposite evergreen leaves, are mentioned on page 21.

FAMILY SALICACEAE

Deciduous trees or shrubs. *Leaves* alternate (except sometimes in *Salix purpurea*), simple; *stipules* often caducous. *Flowers* dioecious, in simple catkins. *Perianth* inferior, cup-like, or of one or more yellow glands. *Stamens* two or more. *Ovary* sessile or pedicelled, unilocular, with two parietal placentae; *ovules* numerous, anatropous. *Fruit* a loculicidal capsule, whose two valves roll backwards on dehiscence; *seeds* minute, concealed by a pencil of silky hairs, which spring from the short funicle; *endosperm* absent.

Two genera and about 200 species mostly in the North Temperate Zone. This family stands isolated, showing no affinities with other *Amentiflorae*, nor, as has been suggested, with the *Tamaricaceae*.

Most *Salicaceae* grow rapidly and affect wet soil, so that they are characteristic lake and riverside trees of the Northern Hemisphere. Poplars multiply freely by suckers, and Willows grow extraordinarily readily from cuttings. The seeds of both Willows and Poplars germinate only on wet mud. These facts may in part account for Virgil's belief that *Populus* and *Salix* arose by spontaneous generation (*Georg.* ii, 13).

Leaves broad, long-stalked. Catkins pendulous; bracts broad, usually more or less laciniate. Perianth cup-like . . . . *Populus*

Leaves usually narrow and short-stalked. Catkins spreading or erect; bracts narrow, entire. Perianth of one or two nectaries . . . . *Salix*

Populus[1] (Poplar)

Trees, often suckering. *Buds* spirally arranged, acute, showing several *scales*. *Leaves* often tremulous owing to lateral compression of the petiole. *Staminate catkins* rendered very conspicuous by the bright red or purple anthers. *Bracts* caducous. *Species* 20–30, mostly North Temperate.

The Poplars gratify three of our senses. They are pleasing to the sight, their leaves make an agreeable rustling sound, and the resinous buds of some species diffuse a delicious aroma.

Section I. **Leuce.**[2]

Bark (Plate I) of young trees and of the boughs of older ones smooth and grey (see also *P. italica*, p. 8) beset with dark rhomboid lenticels. *Leaves* lobed or toothed. *Bracts* ciliate. *Stamens* 8–12.

[1] *pōpulus*, a poplar of some kind (not connected with *pŏpulus* people).

populus et glauca canentia fronde salicta (Verg. *G.* ii, 13).
The poplar and the pale thickets of willow with their glaucous leaves.

[2] *leuce*, λεύκη, a name of *Populus alba*.

P. canescens[1] *Smith* (Grey Poplar). PLATE I

Buds hairy. *Leaves* orbicular-ovate, coarsely toothed, covered beneath when young with a grey, caducous tomentum. *Bracts* laciniate. *Stigmas* oblong, greenish-yellow.

Native of Europe and Asia Minor; probably indigenous in the south and east of England. Note in well-grown trees the stout, smooth, greyish-buff boughs encircled by necklace-like rows of black lenticels. The grey tomentum on the under-surface of the leaves, which rustle noisily in the wind, differs widely in colour from the bark, and contrasts strongly with the dark green upper leaf-surfaces. Suckers are usually abundant, and bear leaves resembling, but larger than, those of *P. alba*, being palmately lobed and having a permanent snow-white tomentum beneath. The same type of leaf is seen on the summer-shoots, which are usually produced freely on specimens planted in gardens. In some continental Floras the Grey Poplar is said to be a hybrid between *P. alba* and *P. tremula*.

P. ALBA[2] *L.* (White Poplar, Abele).

Buds hairy. *Leaves* small, palmately lobed (maple-like), covered beneath with a persistent, snow-white tomentum. *Bracts* toothed or subentire. *Stigmas* filiform, greenish-yellow.

Native probably from south-east Europe to Turkestan.

[1] *cānescens*, white (lit. becoming white). *cānus* and *incānus* are often used with the same meaning in plant names.
[2] *albus, -a, -um*, white.

PLATE I

Bole of POPULUS CANESCENS Smith (Grey Poplar) showing bark characteristic of the section *Leuce* (p. 5).

POPULUS NIGRA L., Black Poplar (p. 8). Note the arching boughs which often bear bosses, and contrast the crown with that of *P. serotina* (Frontispiece).

It is occasionally planted in gardens in this country, where, however, *P. canescens* often passes for it. It is frequently to be seen on seaside esplanades, because it tolerates salt gales. *P. bolleana* is a fastigiate form of this species said to be native in Turkestan. It is occasionally planted in gardens. The common fastigiate 'Lombardy' poplar is *P. italica* (q.v.).

P. tremula *L.*[1] (Aspen).

Buds glabrous. *Leaves* orbicular, coarsely toothed, glabrous. *Bracts* deeply laciniate. *Stigmas* broad, purple.

Native of Europe, N. Africa, and W. Asia. Found locally throughout the British Isles; common in Scotland. The Aspens that grow in the Cambridgeshire woods on calcareous boulder clay belong to the variety *sericea*,[2] in which the leaves, when unfolding, are covered with long, caducous, silky hairs. The var. *glabra*,[3] in which the unfolding leaves are hairless, is the Aspen of the moister western and northern districts of Britain. The sucker-leaves of the Aspen are pubescent, ovate, and acute, with short densely hairy petioles.

P. TREMULOIDES[4] *Michaux*, the most widely distributed North American tree, differs in its pale yellow bark and smaller, more finely crenate leaves, which are ciliate when young. A pendulous variety is cultivated.

[1] *tremulus, -a, -um* quaking, shivering. [2] *sēriceus, a, um* silky.
[3] *glaber, -ra, -rum*, without hair.
[4] *tremuloīdes*, like *tremula*. The Greek termination *-(o)ides*, *-(o)ειδής*, means 'like.'

Section II. **Aegirus.**[1]

Bark soon becoming dark and fissured (except in *P. italica*). *Leaves* regularly serrate, usually acuminate. *Bracts* glabrous. *Stamens* 8–60.

P. ITALICA[2] *Moench* (Lombardy Poplar).

Bark smooth. *Main stem* distinct to the apex of the tree. *Branches* slender, strongly fastigiate. *Stamens* about 20 (carpellary trees very rare).

Native land unknown; often stated to be a fastigiate variety of *P. nigra*, but Moss (ii, p. 9) finds many differences between the two species. The Lombardy Poplar is often planted in the lowlands of Britain, and rows of the trees form useful landmarks in flat districts. Several varieties have been described. All these show a tendency to develop the white smooth bark of the *Leuce* poplars. The variety *thevestina*, which is planted in Algeria, has the whitest bark of all.

P. nigra[3] *L.* (Black Poplar). PLATE II

Bark fissured, usually bearing large bosses. *Branches* massive, spreading, and descending in arches. *Stamens* 8–16.

Native of Europe, N. Africa, and parts of Asia. Not uncommon on rich wet soils in southern and eastern England. Easily known by its arching, usually boss-bearing boughs. At a distance it can be confused with

[1] *aegīrus*, αἴγειρος, a name of *Populus nigra*.
[2] *ītalicus*, *-a*, *-um*, Italian.
[3] *niger*, *-ra*, *-rum*, black.

the Ash (*Fraxinus excelsior*). Groves of these trees (Plate II) present a grotesque appearance. Var. *genuina*[1] (rare): young twigs and petioles glabrous, leaves triangular-ovate, base cuneate. Var. *viridis*;[2] young twigs and petioles hairy, leaves triangular-ovate, base truncate. Var. *betulifolia*;[3] young twigs and petioles hairy, leaves rhomboid, base cuneate, apex long-acuminate.

×P. SEROTINA[4] *Hartig* (Black Italian Poplar).
(FRONTISPIECE)

Bark without large bosses. *Branches* curved, ascending, forming a fan-like crown. *Leaves* with coarse hooked serrations. *Stamens* 20–30 (carpellary plants unknown).

This tree, by far the commonest poplar in the British Isles, is a hybrid between *P. nigra* L. and *P. deltoidea*[5] Marshall, an American species now rarely seen in this country. Its fan-like crown is so unlike that of any of our other trees that students can soon learn to distinguish it at a distance of more than a mile. The leaves are truncate, scarcely cordate at the base; when young they are bronze-coloured, but soon turn green. They unfold long after those of the other poplars (Latin *sērōtinus*, late). The glands usually seen near the junction of the petiole and lamina are inherited from *P. deltoidea*, which resembles *P. serotina* rather closely, but differs from it in the distinctly cordate leaf-bases, the larger, more strongly

[1] *genuīnus, -a, -um*, genuine.
[2] *viridis, -e*, green.
[3] *betulifolius, -a, -um*, birch-leaved.
[4] *sērōtinus, -a, -um*, late, backward.
[5] *deltoīdeus, -a, -um* (for *deltoides*), triangular, shaped like the Greek letter Δ.

hooked and more densely ciliate serrations, and the more suddenly acute apex.

P. canadensis[1] is another hybrid with the same parents as *P. serotina*. It is a carpellary tree and lacks the graceful fan-like crown of *P. serotina*. It has rather the 'church-tower' outline of *Salix alba*. Its leaf-bases are usually cuneate. There are several other hybrid poplars in the nurseries, but they do not figure in the English landscape.

The Poplars belonging to the Section Tacamahacca[2] (Balsam Poplars) are distinguished by their buds, which exude copious aromatic viscous resin, their scarcely flattened petioles, and their leaf-blades, which are white on the under-surface between the fine reticulations.

P. TACAMAHACCA[2] *Miller* (*P. candicans*[3] Aiton), whose origin is unknown, is the only Balsam Poplar commonly planted in this country. It is a small tree with a dense, rather broad crown; the leaves are broadly ovate and have hairy petioles and cordate bases. It suckers freely and the expanding buds diffuse a delicious fragrance after a shower of rain.

P. TRICHOCARPA[4] *Hooker*, native of western North America, grows with us rapidly into a large tree with a narrow outline. It has angular twigs and usually narrower leaves than *P. tacamahacca*.

[1] *canadensis*, Canadian.

[2] *tacamahacca*, the Spanish name of Balsam Poplar. The N. American form is *tacamahac*, a transcription of the original Aztec word.

[3] *candicans*, whitish.

[4] *trichocarpus*, *-a*, having a hairy fruit (θρίξ, τριχός, hair, and καρπός, fruit).

Salix[1] (Willow)

Trees or shrubs. *Buds* spirally arranged (often opposite in *S. purpurea*) showing only one scale (composed of two fused together). *Anthers* usually bright yellow. *Species* 160–170, mostly North Temperate. The following is an introduction to the common lowland willows of Britain.

Osiers are shrubby species of *Salix* whose tough, pliant branches are used in basket-work. They are grown in osier-beds, which are also called osier-holts, and cut down to the ground every year. The most important osiers are varieties and hybrids of *S. purpurea* and *S. viminalis*.

Pollards are arboreous willows, or other trees, which are 'polled' or cut back some eight or ten feet above the ground, so as to produce out of reach of cattle a growth of young branches, which are especially useful for hurdle-making. *Salix alba* and *S. fragilis* are the two species whose picturesque pollards fringe the rivers which wind slowly through our alluvial meadows.

**Leaves alternate. Filaments free.*

Section I. Amerina.[2]

Large trees (often pollarded), seldom shrubs. *Leaves*

[1] *salix*, Willow.
fluminibus salices crassisque paludibus alni (Virg. *G.* ii, 109). Willows by rivers, Alders in heavy marshes.

[2] *amerīnus, -a, -um*, of Ameria (now Amelia), a town in Umbria famous in old times for its Willows.
atque Amerina parant lentae retinacula viti (Virg. *G.* i, 265). And make bands of Amerian willows for the pliant vine.

smooth (*veins* inconspicuous), narrowly lanceolate (often about five times as long as broad), serrate, acuminate. *Catkins* cylindrical; *bracts* yellowish, concolorous. *Capsule* glabrous.

S. alba[1] *L.* (White Willow). PLATES III and IV

Large tree. *Bark* fissured; *ridges* forming a close network. *Twigs* silky, not easily detached. *Leaves* covered densely beneath and sparsely above with white, silky hairs. *Capsule* sessile or nearly so.

Native of Europe, N. Africa, and parts of Asia; grows in wet places throughout the British Isles. Its silver foliage distinguishes it from all other British trees. The pollards by our watersides belong to this species and to *S. fragilis*. When not pollarded or otherwise molested it will attain a height of 30 metres. It then forms a magnificent tree with a rather narrow outline and square head somewhat resembling a church tower. The white under-surfaces and the green upper-surfaces of the leaves make kaleidoscopic displays in the breeze. This species sends masses of whitish rootlets into the water beside which it grows. In var. *caerulea*[2] the branches ascend at an acute angle, giving the tree a remarkably narrow outline, and the leaves have fewer hairs. This variety yields the best timber for cricket-bats. Var. *vitellina*[3] has orange-red twigs and smaller leaves.

[1] *albus, -a, -um,* white.
[2] *caeruleus, -a, -um,* blue.
[3] *vitellīnus, -a, -um,* coloured like the yolk of egg.

SALIX ALBA L., White Willow (p. 12). A well-grown unpollarded specimen. Note the rather narrow outline.

SALIX ALBA L., White Willow (p. 12), and S. FRAGILIS L., Crack Willow, Withy (p. 13), growing side by side. Note the broader crown of *S. fragilis*.

S. fragilis[1] *L.* (Crack Willow, Withy). PLATE IV

Large tree. *Bark* fissured; *ridges* forming an open network. *Twigs* glabrous, shining, easily detached. *Leaves* glabrous, often glaucous beneath. *Capsule* pedicelled.

Native of Europe, and N. and W. Asia. This tree may be distinguished from *S. alba* at a great distance by its wider angle of branching, which gives to the crown of unpollarded specimens a much broader, nearly circular outline. The leaves are larger and have coarser serrations; the glaucous colour sometimes seen on their undersurface is due to a layer of wax, which is easily rubbed off. The twigs separate very readily with a distinct snap, and leave a circular scar. Even large branches break off with much less difficulty than those of *S. alba*. Ascherson and Graebner describe the appearance of an avenue of these two species after a great gale. The White Willows were unscathed, but the Withies were sadly torn and tattered. The coral-like rootlets which this species sends into the water are red.

S. BABYLONICA[2] *L.* (Weeping Willow) is native of China, and has been planted in many lands for centuries. It is allied to *S. fragilis*, from which it differs in its paler, narrower leaves borne on long, weeping branches. The leaves come out earlier and fall later than those of any of our deciduous trees. Many of our 'Weeping Willows' are probably hybrids

[1] *fragilis, -e,* brittle.
[2] *babylōnicus, -a, -um,* Babylonian.

between *S. babylonica* and *S. fragilis*. *S. salamoni* is a magnificent hybrid between *S. babylonica* and *S. alba*. The so-called 'American Weeping Willow' is a pendulous variety of *S. purpurea*, which is grafted upon standards.

S. triandra[1] *L.* (Almond-leaved Willow).

A shrub or small tree. *Bark* not fissured, separating in large, reddish flakes. *Twigs* glabrous, not easily detached. *Leaves* glabrous, dark green, and shining; *stipules* large, persistent. *Bracts* persistent.

Native of Europe and N. Asia. This is a smaller plant than the three preceding ones, seldom exceeding the dimensions of a large shrub. The bark scaling to expose the delicate cinnamon-like under layers, and dark shining leaves, readily distinguish it from our other Willows. It flowers in April, rivalling *Acacia*[2] *dealbata*[3] (the 'Mimosa' of our flower shops) in its array of yellow, and often again in July and August. A charming and interesting Willow not related to the other European species, but closely allied to the American *S. nigra* Marsh., and to several tropical species. Smells and tastes of sweet almonds. The stamens are three in number.

S. pentandra[4] *L.*, a magnificent Willow growing in the northern parts of the British Isles, with broad, dark green, shining, fragrant leaves, has five or more stamens.

[1] *triandrus, -a, -um*, having three stamens.
[2] *acācia*, name of species of this genus.
[3] *dealbātus, -a, -um*, whitened.
[4] *pentandrus, -a, -um*, having five stamens.

Section II. **Vetrix.**[1]

Shrubs, rarely trees. *Leaves* ovate or elliptic (twice or thrice as long as broad), usually tough and wrinkled, and with villous and palpably prominent *veins* on the lower surface (in *S. repens* the lower leaf-surface is smooth and silky). *Catkins* ovoid, precocious, at first densely silky; *bracts* with discolorous tips. *Capsule* silky.

S. caprea[2] *L.* (Palm, Goat Willow, Great Sallow). *Twigs* glabrous or nearly so, often ruddy. *Buds* large, glabrous. *Leaves* about twice as long as broad, usually apiculate.

Native of Europe and northern Asia, extending to Japan. Usually a shrub, but occasionally a tree. Much less common, particularly in the east of England, than *S. cinerea.* Branches bearing staminate catkins of both these species are called 'palm' when they are used to decorate churches on Palm Sunday. In central Europe the Goat Willow is an object of much superstition.

S. cinerea[3] *L.* (Common Sallow). *Twigs* and *buds* hairy, blackish. *Leaves* about three times as long as broad, usually obtuse; *margin* usually narrowly revolute.

Native of Europe, N. Africa, the Caucasus, and western Asia to Kamschatka. This is the commonest British Willow, and the Sallow of the Fens, where it is very

[1] *vetrix*, the Italian word *vetrice* latinized by Caesalpinius.
[2] *caprea*, a wild she-goat. [3] *cinereus*, *-a*, *-um*, ash-coloured.

abundant, and where *S. caprea* is seldom seen. When the bark is peeled off the twigs of this species and of *S. aurita*[1] the wood shows sharp longitudinal ridges, which are not present in other Willows. The revolute margin of the leaf is readily felt with the thumb (see *S. nigricans*).

S. aurita[1] *L.* is found chiefly on acid soils. It is a low shrub with widely spreading, slender, angular branches, glabrous at maturity. The leaves are smaller and more wrinkled than those of either *S. caprea* or *S. cinerea*, and the stipules are remarkably large.

The stigmas in the foregoing three Willows are nearly sessile. *S. nigricans*[2] Smith and *S. phylicifolia*[3] L., which grow in Scotland and the north of England, have distinct styles. The foliage of *S. nigricans*, which is an exceedingly variable plant, often resembles that of *S. cinerea*; but the leaves of *S. nigricans* are more acute, and their margins are usually flat. The leaves of this species, as its name implies, blacken on drying. *S. phylicifolia* is a magnificent plant with burnished chestnut twigs and leaves glaucous beneath and vividly green and shining above. Both flower later than *S. caprea*, *S. cinerea*, and *S. aurita*. See Hooker's remarks on these two species (*Student's Flora*, pp. 373–4).

[1] *aurītus, -a, -um*, long-eared (referring to the conspicuous stipules).
[2] *nigricans*, becoming black (when dried).
[3] *phylicifolius*, having leaves like *Phylica* (*Rhamnaceae*).

S. DAPHNOIDES[1] *Vill.* (Violet Willow), a native of central Europe and north Asia, is often planted in gardens. It belongs to a division of *Vetrix* which is called *Pruinosae*[2] because the twigs when young are covered with a beautiful waxy bloom like that seen on a plum. The leaves of *S. daphnoides* resemble those of an *Amerina* Willow. Its inner bark is citron yellow.

S. repens[3] *L.* (Creeping Willow).

Small shrub growing from rhizomes. *Leaves* very variable in shape, shining green above, covered with silvery silky hairs beneath; *margins* entire, revolute.

Native of Europe, and from Asia Minor to central Asia. A very variable plant widely distributed in Great Britain. Three varieties are admitted by Moss. Var. *ericetorum*[4] grows on the light acid soils of siliceous hill-slopes, heaths, and moors. It usually has prostrate branches and nearly sessile carpellary catkins. Var. *fusca*[5] grows on the alkaline peat of the fens. It is an erect shrub not often more than a metre high with carpellary catkins on leafy peduncles. Very closely allied to it is var. *argentea*,[6] which grows on sand-dunes. (See *C.B.F.*, ii, 49.)

Section III. **Viminales.**

Shrubs with remarkably long, straight, flexible branches. *Leaves* very narrow (ten to twenty times as long as broad).

[1] *daphnoīdēs* (δαφνοειδής) laurel-like.
[2] *pruīnōsus, -a, -um,* covered with hoar-frost. [3] *rēpens,* creeping.
[4] *erīcētōrum,* genit. pl. of *erīcētum,* a heath (lit. community of *Erica*)
[5] *fuscus, -a, -um,* swarthy. [6] *argenteus, -a, -um,* silvery

S. viminalis[1] *L.* (Common Osier).

Leaves dark green above, with silvery glistening silky hairs beneath. *Capsule* tomentose.

Native of Europe and north Asia, extending to Japan. Easily known by its wand-like branches and remarkably narrow leaves silvery beneath. It is often planted as an osier. Hybrids between this species and *S. caprea* and *S. cinerea* are common in osier beds. In these hybrids the glistening silky lower leaf-surface of *S. viminalis* is always retained, but the leaves are considerably broader than those of *S. viminalis*. One of these hybrids has been produced artificially (see *C.B.F.*, ii, 63).

S. INCANA *Schrank*, native of central and southern Europe and Asia Minor, is cultivated in our gardens, often under the wrong name of *S. rosmarinifolia*.[2] It resembles *S. viminalis*, but has smaller leaves with more strongly revolute margins and looser, less glistening hairs beneath. The stamens are united below and the capsules are glabrous. Because of the partially united stamens this species is usually associated with *S. purpurea*.

***Leaves often opposite or nearly so. Filaments completely united.*

Section IV. **Synandrae.**[3]

Shrubs. *Leaves* membranous, about six times as long

[1] *vīmināl*is, *-e*, pertaining to osiers.

[2] *rosmarīnifolius*, *-a*, *-um*, having leaves like those of the rosemary.

[3] *synandrus*, *-a*, *-um*, having united stamens.

as broad, glaucous, often broader towards the end. *Bracts* dark-tipped.

S. purpurea[1] *L.* (Purple Osier).

Leaves glabrous, usually oblanceolate and serrulate, very glaucous beneath; *midrib* broad, translucent; *stipules* caducous.

Native of Europe, N. Africa, western and central Asia to Korea, China, and Japan. A dome-shaped bush, known at a distance by its soft glaucous hue. It may well be the *molle siler* which fringes the winding rivers (Virg. *G.* ii, 12). It is common in many parts of the lowlands of Britain on the banks of rivers and in other damp situations. The bark is very bitter from the presence of salicin, a crystalline substance which was much used in medicine before it was to a great extent supplanted by the synthetic salicyl bodies, of which Aspirin (aceto-salicylic acid) is the best known. It is an important osier, and its twigs are often boiled to strip off the bark, and to impart a red colour to the wood. Salicin can be conveniently obtained from the resulting liquor. The staminate catkins are remarkably beautiful; the brick-red unopened anthers contrast pleasingly with the golden pollen and the jet-black tips of the bracts. They open from above downwards.

The species of *Salix* belonging to the Section **Chamaetia**[2] are dwarf alpine and arctic shrubs with creeping rhizomes. Their branches are prostrate, and

[1] *purpureus*, purple, red.

[2] *chamaetia*, dwarf willow (*χαμαί*, on the ground; *ἰτέα*, willow).

bear terminal catkins. Their leaves have comparatively long petioles and broad laminae. Two species grow in the mountainous districts of Britain. They are: *S. reticulata*[1] L., with coriaceous, reticulate leaves, and *S. herbacea*,[2] with membranous, smooth leaves. The perianth of *S. reticulata* somewhat resembles that of a *Populus*, and its suckering habit, long petioles, and broad laminae all recall that genus (*C.B.F.*, ii, 25). In spite of their low stature the Chamaetia Willows are never herbaceous; they always possess persistent woody branches.

[1] *rēticulātus, -a, -um*, with veins forming a conspicuous network.
[2] *herbāceus, -a, -um*, herbaceous, i.e. herb-like (not woody).

FAMILY GARRYACEAE

Shrubs, rarely trees. *Leaves* opposite, evergreen, entire; *petioles* united at the base. *Flowers* dioecious, in primarily racemose, often catkin-like, inflorescences. *Bracts* decussate, each pair often united to form a cup. *Staminate flowers* with four tepals, with which the four stamens alternate. *Carpellary flowers* naked; *ovary* unilocular with two anatropous ovules pendulous from the apex; *styles* two, stigmatic on their inner sides. *Fruit* with thin brittle pericarp and 1–2 seeds embedded in red pulp. *Endosperm* copious.

The only genus, *Garrya*,[1] consists of 15 species native of the warmer parts of North America. There is a single species, *G. fadyeni*, in the West Indies. The affinities of the genus are very obscure. It was formerly included in the *Cornaceae*.

G. ELLIPTICA[2] *Douglas*.

An evergreen shrub. *Twigs* green, terete. *Leaves* elliptic, apiculate, tomentose beneath. *Catkins* grey, pendulous; *bracts* decussate, each pair connate to form a cup.

Native of California and Oregon. Planted in our gardens, and thriving in the south and west. It produces its catkins in the winter.

[1] *Garrya*, called by Douglas after Nicholas Garry.
[2] *ellipticus, -a, -um*, elliptic.

FAMILY MYRICACEAE

Trees or shrubs. *Leaves* alternate, simple, exstipulate, often sweet-scented. *Flowers* monoecious or dioecious, in simple, rarely compound, catkins, often bracteolate. *Perianth* absent. *Staminate flowers* with 2–16 (usually 4) stamens; *filaments* very short. *Carpellary flowers: ovary* unilocular with one basal, orthotropous ovule with one integument; *style* short; *stigmas* 2, filiform. *Fruit* a drupe, in our species 2-winged by the enlarged, adnate bracteoles, surface often waxy; *seed* without endosperm.

Myrica[1]

This is the only genus, of which there are about 40 species, mostly tropical.

M. gale[2] *L.* (Bog Myrtle, Sweet Gale).

Twigs after the first year glabrous, reddish-brown, and shining. *Leaves* oblanceolate, with a few serrations towards their ends, dotted above and beneath with golden-yellow glands, deliciously scented.

[1] *myrīca* (μυρίκη), a kind of tamarisk.
[2] *gāle*, a name of Teutonic origin (cf. German *Gagel*).

Native of western and north-western Europe, north Asia, and North America. In Britain the Bog Myrtle affects heaths and moors but it grows also on fens. It is the only species of the sub-genus *Gale*, characterized by having the bracteoles connate with the fruit. The above diagnosis distinguishes the leaves from those of *Salix cinerea*.

The thickness and succulence of the pericarp varies greatly in different species. The fruit of the Asiatic *M. nagi*[1] Thunb. is juicy and edible. That of *M. faya*[2] Ait., a sclerophyllous species abundant in the Canary Islands, Madeira, and Azores, though slightly succulent, is austere and scarcely fit to eat.

In North America the waxy covering of the fruit of *M. cerifera*[3] L., and of other species, is removed by boiling and used for various purposes. The wax was of importance to the early American settlers, who made their candles of it.

[1] *nagi*, from its Japanese name.
[2] *faya*, the Spanish name of this species.
[3] *cēriferus*, *-a*, *-um*, wax-bearing.

FAMILY JUGLANDACEAE

Deciduous trees. *Leaves* alternate, pinnate, exstipulate. *Flowers* monoecious. *Staminate flowers* in dense catkins on the twigs of the previous year; *perianth* of four or fewer tepals, rarely absent; *stamens* 3–40. *Carpellary flowers* few, sessile on the twigs of the current year; *perianth* fused with the ovary and with the bract and bracteoles; *ovary* inferior, unilocular, with one basal orthotropous ovule with one integument. *Fruit* a drupe or nut; *seed* exalbuminous.

Five genera and about 40 species, most of which are natives of the North Temperate Regions, some penetrating into the warmer parts of Asia. They seem to form a link between the *Myricaceae*, which they resemble particularly in the ovary and ovule, and the *Fagaceae* and *Betulaceae*, which they approach nearly in the arrangement of their flowers.

**Pith septate, perianth present.*

Fruit a large drupe with indehiscent flesh and wrinkled stone, not winged . . *Juglans*

Fruit a nut, winged by the adnate bracteoles *Pterocarya*

***Pith continuous, perianth absent or nearly so.*

Fruit a drupe with flesh dehiscing into four valves; stone almost smooth. . . . . *Carya*

Juglans[1]

Trees with resinous bark. *Twigs* with septate pith. *Buds* spirally arranged, ovoid, scale-clad. *Staminate catkins* single. *Species* 15, Old and New World.

J. REGIA[2] *L.* (Common Walnut).

Bark smooth and whitish between the fissures. *Leaves* very fragrant when crushed; *leaflets* about seven, nearly entire, with stout petiolules and cuneate bases.

The Walnut is native from south-east Europe far into Asia. Since it is cultivated in many countries, and often springs up from self-sown seed, as it does in some parts of England, its native range is difficult to define. The unripe drupes make a delicious pickle. The stones of the ripe drupes are called 'walnuts'. The fleshy part of the pericarp has been compared with the scalp, the bony putamen with the skull, the testa with the pia mater, and the folded cotyledons with the convolutions of the brain.

J. NIGRA[3] *L.* (Black Walnut).

Bark black with acute ridges between the close fissures. *Leaflets* 12 or more, finely serrate.

Native of eastern and central North America; occasionally planted in gardens and parks in this country.

[1] *jūglans* (*Jovis glans*, Jupiter's nut), walnut.
[2] *rēgius, -a, -um*, royal. [3] *niger, -ra, -rum*, black.

Pterocarya[1]

Trees. *Twigs* with septate pith. *Buds* spirally arranged, usually naked. *Staminate catkins* single. *Species* 5, all in east Asia except the following:

P. FRAXINIFOLIA[2] *K. Koch* (Caucasian Wing-nut).

Bark with long, flexuous, smooth strips between the fissures. *Leaflets* 7–21 or more, sessile, with auricles at the base, finely serrate. (*P. caucasica*[3] C. A. Meyer.)

Native of the Caucasus and Persia. This tree is usually seen with a single trunk and handsome crown, but when it is planted in moist places it tends to sucker freely. In the Cambridge University Botanic Garden it has formed in this way a remarkably dense thicket about a stream. Thickets similar, though much less extensive, may be seen beside the water in the grounds of Syon House near Kew.

Carya[4] (Hickory, Pecan)

Trees. *Pith* continuous. *Staminate catkins* fascicled, or in threes at the ends of twigs arising from the axils of fallen leaves. *Species* 10 in N. America.

Several species are in cultivation. According to Bean *C. amara*[5] (*C. cordiformis* K. Koch) is the hardiest and best grower. It is a lofty tree with scaling bark and bright yellow buds.

[1] *Pterocarya*, winged nut (πτερόν, wing; κάρυον nut).
[2] *fraxinifolius, -a, -um*, with leaves like the ash.
[3] *caucasicus, -a, -um*, Caucasian.
[4] καρύα, the walnut tree.
[5] *amārus, -a, -um*, bitter.

FAMILY BETULACEAE

Trees or shrubs. *Leaves* alternate, simple; *stipules* caducous. *Flowers* monoecious, in compound catkins or spikes which usually appear before the leaves; *partial inflorescences* dichasial, *perianth* bract-like, present in flowers of one sex only. *Staminate flowers* more or less adnate to their bracts; *stamens* 2–10, often split and then each half bearing a half-anther. *Ovary* inferior, bilocular at the base, each loculus containing a pendulous, anatropous ovule with one integument; *styles* 2. *Fruit* a nut; *seed* albuminous.

Six genera and considerably over 100 species, of which most are natives of the North Temperate Regions. The *Betulaceae* are represented in the deciduous woodlands of Europe by few species but by an enormous number of individuals. The family is closely allied to *Fagaceae*, from which it differs in the number of styles, in the staminate flowers being adnate to their bracts, in the frequently divided stamens, in the absence of 'cupule', with which the purely foliar involucre of *Corylus* must not be confused, and in the ovules having only one integument.

Tribe I. CORYLEAE.

Perianth present in carpellary flowers and absent from

staminate flowers. *Nut* more or less enclosed in a foliaceous involucre formed of united bracteoles.

Carpellary catkins minute, bud-like. Involucre leafy, enclosing the large, acorn-like nut *Corylus*

Carpellary catkins long, pendulous. Nut small, not enclosed but clasped by the base of the flat, 3-lobed involucre . . . *Carpinus*

Carpellary catkins short, erect. Nuts small, enclosed by the bases of the involucres, which imbricate so as to form a cone-like infructescence *Ostrya*

Tribe II. BETULEAE.

Perianth present in staminate flowers and absent in carpellary flowers. *Nut* often winged or margined, without involucre.

Stamens 2, filaments split. Carpellary catkins with 3-lobed, deciduous scales . . *Betula*

Stamens 4, filaments not split. Carpellary catkins with 5-lobed, black, woody, persistent scales *Alnus*

Corylus[1] (Hazel).

Trees or shrubs flowering very early. *Buds* spirally arranged, globose; *scales* ciliate. *Staminate catkins* long, pendulous; each bract supporting two bracteoles,

[1] *corylus*, hazel.
Cur non . . . hic corylis mixtas inter consedimus ulmos (Virg. E. v, 1–3).
Why not sit here among elms interspersed with hazels?

which bear a naked flower consisting of four stamens, each branched almost to the base. This is the central flower of the cyme; the two lateral ones are suppressed. *Carpellary catkins* bud-like; each bract bearing two flowers, the central one of the cyme being suppressed. *Species* 8, North Temperate.

C. avellana[1] *L.* (Common Hazel).

Shrubby, freely suckering. *Bark* smooth, shining, reddish-brown. *Twigs* glandular-hispid. *Leaves* orbicular-cordate, doubly serrate, cuspidate. Involucre campanulate, scarcely longer than the nut.

Native of Europe and west Asia. In Britain it is very common, especially in Oak and Ash woods. The Common Hazel is the dominant 'coppiced' shrub (cut to the stools every 10–15 years) of the Oak-hazel wood, which with its restricted number of spreading standard oaks and a continuous hazel shrub layer is the traditional old English form of oak-wood culture, now become uneconomic and destined to disappear. The yellow staminate catkins and the crimson stigmas emerging from the tips of the bud-like female catkins are conspicuous from January to March, the catkins opening as the weather allows.

C. MAXIMA[2] *Mill.* Larger shrub than *C. avellana*. *Involucre* longer than the nut, and prolonged beyond it into a tube (*C. tubulosa*[3] Willd.).

[1] *avellānus, -a, -um.* Pliny called the hazel nut *nux avellana*. *Avella* is the name of an Italian town.
[2] *maximus, -a, -um,* largest, very large.
[3] *tubulōsus, -a, -um,* tubular.

C. COLURNA[1] *L.*, the Turkish Hazel, native of SE. Europe and Asia Minor, is sometimes seen in collections of trees. It is a large tree with scaling bark. The nuts are borne in dense clusters, and the edge of the involucre is prolonged into numerous narrow segments.

Ostrya[2]

Trees. *Buds* ovoid, found only at the end of the twigs. A genus differing from *Carpinus* in its unlobed involucres, which imbricate to form a hop-like infructescence. Each fruit is completely enclosed by the base of its involucre.

O. CARPINIFOLIA[3] *Scop.*

Shrub or small tree. *Bark* at first smooth and pale, later separating in rough dark strips. *Twigs* and *petioles* more hairy than in the Hornbeam. *Leaves* hairy above.

Native of S. Europe and Asia Minor, where it grows in damp situations shaded from the southern sun. The leaves are distinguished with difficulty from those of the Hornbeam; the hairs on the upper surface must be looked for under a lens. The closely allied American species *O. virginica*[4] Willd. differs by its twigs often bearing gland-tipped hairs, by its leaves having fewer lateral veins, and by its larger nut. The two are sometimes united into a single species called *O. italica.*

[1] *colurnus, -a, -um,* lit. made of hazel.
[2] *ostrya,* from ὀστρύα, the name of a tree.
[3] *carpinifolius, -a, -um,* with leaves like those of *Carpinus.*
[4] *virginicus, -a, -um,* of Virginia.

CARPINUS BETULUS L., Hornbeam (p. 31). Note the widely spreading boughs grown in open canopy and the deeply furrowed bark (cf. Plate VI). Cobham Park, Kent.

Bole of old Hornbeam near Ingatestone, Essex, showing characteristic flutings and buttressing (*Phot.* Miller Christy, 'The Hornbeam in Britain', Fig. 3, *Journ. Ecol.*, XII, 1924).

Carpinus[1]

Trees. *Buds* (in our species) narrow, distichous, more or less appressed to the twig. *Staminate catkins* lateral, pendulous; *bracts* ovate, each supporting 4–12 stamens; *bracteoles* absent. *Carpellary catkins* terminal, pendulous, and lax in fruit; *cymes* two-flowered (central flower suppressed; but all six bracteoles present). *Species* about 20, chiefly North Temperate.

C. betulus[2] *L.* (Hornbeam). PLATES V and VI

Tree with fluted trunk, and smooth, grey bark. *Leaves* ovate, doubly serrate, folded between the conspicuous lateral nerves; *base* oblique; *petiole* with scattered white hairs.

Native of Europe and west Asia; indigenous in south-east England. As it tolerates frequent cutting, it is much coppiced, replacing Hazel in some parts of the country, and is sometimes used for hedges and arbours. It is somewhat rare to find an unmutilated tree in England. The wood is very hard (hence the name horn beam or horn tree) and difficult to work. It was traditionally used for ox-yokes and various articles later made of metal. It provides excellent fuel.

Easily recognized by its trunk, which resembles that of the Beech in being grey and devoid of cork; but differs in having longitudinal grooves and compressions. The

[1] *carpīnus*, Hornbeam.

[2] *betulus*, said to refer to the similarity of the leaves to those of species of *Betula*.

trunk of the Beech is approximately circular in section: that of the Hornbeam presents an irregular figure. When fissures appear on the trunk of the Hornbeam the smooth strips of bark between them somewhat resemble those on the trunk of *Pterocarya fraxinifolia.*

Betula[1] (Birch)

Graceful trees and shrubs. *Bark* usually separating in papery layers, which display a wide range of colour; *lenticels* long, straight, horizontal. Birch bark is used for many purposes; the North American Indians make efficient canoes of the bark of *B. papyrifera*[2] Marsh. That of *B. lenta*[3] yields oil of wintergreen (methyl salicylate). *Species* about 40, North Temperate and Arctic.

The two following species often grow together, and hybrids between them abound. They are especially abundant on and characteristic of sandy or gravelly heath and grassland in the south of England, where birchwood forms a well-marked stage in the succession to oakwood.

B. alba *L.* PLATE VII

Twigs glabrous except for the presence of peltate glands, whose resinous secretion is very conspicuous on shoots of the current year, and especially abundant on young coppice shoots. *Leaves* doubly serrate, acuminate. *Bracts* with reflexed lateral lobes.

[1] *betula*, Birch. [2] *papȳriferus*, *-a*, *-um*, paper-bearing (the bark).
[3] *lentus*, *-a*, *-um*, pliant.

Native of Europe (extending to 65° N.) and of parts of temperate Asia and North America. It is widely distributed and abundant in Britain, but commonest in our eastern and southern parts. It tolerates a wide range of soils, affecting sands, gravels, and limestones, as well as both acid and alkaline peats.

B. pubescens[1] *Ehrh.*

Twigs pubescent. *Leaves* irregularly serrate, not acuminate. *Bracts* with spreading or erect lateral lobes.

Native of Europe (extending to 71° N.), and of temperate Asia and N. America. It occurs commonly throughout Britain, but is particularly abundant on soils derived from the older siliceous rocks of the north and west, where it may form a definite zone above the wood of *Quercus sessiliflora*. It is by far the commonest tree in Scotland.

The species of *Betula* belonging to the section *Nanae* are shrubs with brown bark; small, broad, obtuse leaves reticulate beneath; and short, erect catkins. *B. nana*[2] L., the Dwarf Birch, with orbicular crenate leaves often broader than long, is the only British species. It grows in Scotland on peat moors. Its leaves are found embedded in glacial peat at Barnwell near Cambridge, together with those of arctic willows. The continental *B. humilis*[3] Schrank has ovate leaves and twigs beset with clear yellow glands.

[1] *pubescens*, hairy.
[2] *nāna*, *-ae*, a female dwarf.
[3] *humilis*, *-e*, on the ground.

Alnus[1] (Alder)

Deciduous trees or shrubs. *Buds* spirally arranged, usually pedicelled. *Species* 17, Old and New Worlds.

**Buds pedicelled. Fruits margined or narrowly winged.*

A. glutinosa[2] *Gaert.* (Common Alder).

A tree. *Bark* greyish-black. *Leaves* obovate to orbicular, dark green, glabrous, more or less serrate, with cuneate base and truncate or retuse apex.

Native of Europe, parts of Asia, and N. America. Widely distributed in Britain. Known throughout the year by the persistent, black, cone-like, carpellary catkins. It thrives best with its roots in contact with well-aerated water, and avoids the more acid soils. It is the dominant tree in the Fen 'carr' (Fen wood) of the Norfolk Broads. It is known from the number of its pollen grains preserved in peat that it was far more abundant in Britain through much of post-glacial times than it is now.

A. INCANA[3] *Moench* (Grey Alder).

A tree. *Bark* smooth, greyish-white. *Leaves* ovate-elliptic, doubly serrate, bluish-green and hairy beneath when young; base rounded; apex acute.

Native of Europe and of Atlantic North America. Planted in England and naturalized here and there.

[1] *alnus*, Alder.
tunc alnos primum fluvii sensere cavatas (Virg. *G.* i, 136).
then the rivers first knew hollowed alders.

[2] *glūtinōsus*, *-a*, *-um*, viscous.

[3] *incānus*, *-a*, *-um*, hoary.

The trunk is usually crooked with grooves and compressions like those of the Hornbeam. Suckers freely.

A. CORDIFOLIA *Tenore*, native of S. Italy, Corsica, and W. Asia, is sometimes planted. It has handsome suborbicular leaves with cordate bases and carpellary catkins an inch or more in length.

***Buds sessile. Fruits broadly winged.*

A. VIRIDIS *DC.*

Shrub. *Leaves* ovate, doubly serrate, bright green on both surfaces.

Widely distributed in Europe, temperate Asia, and N. America. On siliceous soils in the Alps it forms almost impenetrable miniature woods corresponding to the vast thickets of *Pinus montana* in calcareous localities. Intermediate between *Alnus* and *Betula*. The pith of the young twigs is approximately circular on section, not 3-rayed as in the three preceding species.

FAMILY FAGACEAE

Trees or shrubs. *Leaves* alternate, simple; *stipules* usually caducous. *Flowers* monoecious, in simple or compound catkins; *perianth* bract-like, present in flowers of both sexes. *Stamens* variable in number. *Carpellary flowers* seated singly or in groups in a 'cupule', which is beset with scales or bristles; *styles* 3–6; *ovary* inferior, trilocular at the base, each loculus with 1–2 pendulous, anatropous ovules with two integuments; *styles* 3. *Fruit* a nut seated in, and sometimes enclosed by, the enlarged cupule.

Five genera and about 400 species. This family is much more widely distributed than the *Betulaceae*, but no species occurs in Africa south of the Sahara. Several species are dominant components of the woodlands of Europe.

Staminate catkins globose, pendulous. Cupules spiny, each enclosing two sharply triangular nuts . . . . . *Fagus*

Staminate catkins slender, pendulous. Cupules each containing a single terete nut . *Quercus*

Staminate catkins slender, erect. Cupules thickly beset with bristles, each enclosing 2–3 bulky, ovoid, lustrous nuts . . . *Castanea*

Fagus[1] (Beech)

Deciduous trees with smooth, grey bark. *Buds* distichous, many-scaled, very narrow, forming a wide angle with the twig. *Staminate catkins* borne on slender peduncles; *perianth* campanulate, 4–7 lobed. *Nuts* completely enclosed in the hard cupule. *Species* about 7, North Temperate region.

F. silvatica[2] *L.* (Beech).

Trunk cylindrical. *Bark* smooth, grey. *Buds* slender, glabrous, acute. *Leaves* ovate or elliptic; *margin* undulate, ciliate when young.

Native of Europe; its native distribution in England has been much disputed.

The beech often forms practically pure woods, and its dense shade allows but little undergrowth. *Taxus*[3] *baccata*[4] is abundant in some English beech woods, *Prunus*[5] *avium*[6] is locally abundant on their margins. *Pirus*[7] *aria* (the White Beam) is an occasional constituent. *Fraxinus*[8] *excelsior* occurs here and there as

[1] *fagus*, Beech.

Tityre, tu patulae recubans sub tegmine fagi.
You, Tityrus, lying beneath the canopy of a spreading beech. (Virg. *E.* i, 1.)

[2] *silvāticus*, *-a*, *-um*, growing in woods (*silvestris*, *-e*, in botanical latin means 'wild').

[3] *taxus*, Yew.

[4] *baccātus*, *-a*, *-um*, berry-bearing.

[5] *prūnus*, Plum Tree.

[6] *avium* (genit. pl. of *avis*), of birds.

[7] *pirus*, Pear Tree.

[8] *fraxinus*, Ash.

fraxinus in silvis pulcherrima, pinus in hortis,
populus in fluviis, abies in montibus altis. (Virg. *E.* vii, 65–6.)
The Ash is loveliest in woods, the Pine in gardens, the Poplar by rivers, and the Fir on lofty mountains.

a relict of an earlier stage of succession. The ground flora is scanty or absent under the densest shade but increases as the canopy opens out. The beech woods of the continent are very extensive; they have a richer ground flora than those of England. The nuts yield an oil; they are edible, but are said to be narcotic when taken in excess.

Nothofagus[1]

About a dozen species native of temperate South America and Australasia. The leaves are smaller than those of the true Beeches and often evergreen. The staminate flowers are solitary or in threes, never in globose catkins. There are often three nuts in each cupule.

Quercus[2] (Oak)

Trees or shrubs. *Buds* ovoid, many-scaled, spirally arranged, and aggregated at the ends of the twigs. *Leaves* evergreen or deciduous, lobed to entire. *Staminate catkins* simple, slender. *Species* about 200.

[1] *nothofāgus*, False Beech (*νόθος*, spurious, and *fagus*).

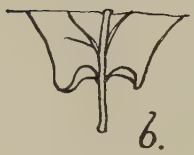
[2] *quercus*, Oak.

> *sicubi magna Iovis antiquo robore quercus*
> *ingentis tendat ramos, aut sicubi nigrum*
> *ilicibus crebris sacra nemus accubet umbra.*
>
> (Virg. *G.* iii, 332–4).

Wheresoever some large oak of Jupiter with his ancient timber stretches forth giant branches, or where the forest black with many a holm oak rests with its sacred shadow.

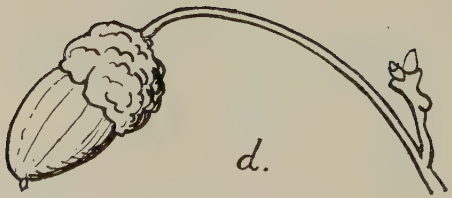
BETULA ALBA L., Silver Birch (p. 32). Note the graceful habit, narrow crown with few and slender ascending branches, and fine rather scanty pendulous spray. Near Lochan Eilein, Inverness-shire. The wood behind is mainly composed of *Betula pubescens*.

a.



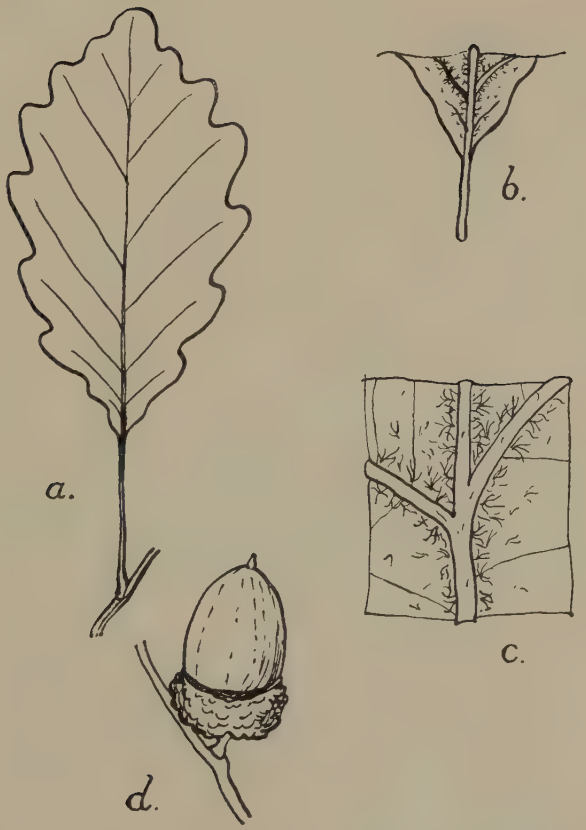
b.

c.



d.

QUERCUS ROBUR L. (p. 39). *a*. Leaf, upper surface, slightly reduced. *b*. Base of leaf, lower surface showing auricles, nat. size. *c*. Portion of lower surface of leaf, enlarged. *d*. Acorn, slightly reduced.



QUERCUS SESSILIFLORA Salisb. (p. 39). *a*. Leaf, upper surface, slightly reduced. *b*. Base of leaf, lower surface, natural size. *c*. Portion of lower surface of leaf, enlarged. *d*. Acorn, slightly reduced.

QUERCUS ROBUR L., Common Oak (p. 39), Cobham Park, Kent. Note the massive trunk, wide crown with spreading limbs, and zigzag branching.

**Deciduous.*

Q. robur[1] *L.* (Common Oak). PLATES IX and X

Leaves glabrous, sessile or shortly petioled; *lamina* with obtuse *lobes*, and small sharply reflexed auricles at the base. *Acorns* borne on long slender peduncles; *cupule* with appressed imbricating scales. (*Q. pedunculata* Ehrh.)

Native of Europe and parts of Asia. This is the commonest tree of the south and midlands of England, and was the chief dominant of the original forest of these regions. It abounds on clays and heavy loams, but tolerates a wide range of soil. When growing with *Q. sessiliflora* the two hybridize freely.

Q. sessiliflora[2] *Salisb.* (Sessile-fruited Oak).

PLATE VIII

Leaves with multiple or bifid hairs beneath, long-petioled; *lamina* tapering towards the petiole without auricles; *lobes* obtuse. *Peduncles* short and stout, or absent. *Cupules* as in *Q. robur*.

Native of western and central Europe to Poland and eastwards to Persia. In Britain it affects siliceous and leached soils, often forming pure woods on the hill-slopes of the north and west. The laminae are flatter than those of *Q. robur* and have shallower, more regular lobes.

The following are the three commonest AMERICAN OAKS in cultivation: they all three have long-petioled

[1] *rōbur*, heart of oak, oak-timber, oak-tree.
[2] *sessiliflōrus*, *-a*, *-um*, with sessile flowers.

leaves glabrous except for hair-tufts in the axils of the nerves beneath, and bristle-pointed leaf-lobes.

Q. RUBRA[1] *L.* Bark of the young trees grey, not fissured. *Leaves* dull, obovate; *lobes* as broad as the sinuses, which reach about half-way to the midrib; *axil-tufts* inconspicuous or absent. *Acorns* about 1 inch long; *cupules* saucer-shaped.
Grows well in England. Often planted for its fine red autumn tints.

Q. PALUSTRIS[2] *Du Roi.* Closely allied to *Q. rubra.* *Leaves* shining, more deeply cut into lobes narrower than the sinuses; *axil-tufts* conspicuous. *Acorns* about ½ inch long; *cupule* saucer-shaped.
Leaves turn scarlet in autumn.

Q. COCCINEA[3] *Wang.* *Leaves* very variable; *lobes* usually very narrow with few or no teeth. *Cupule* narrow.
'The true scarlet oak retains its leaves until November or December, and for the last six or eight weeks they are of a brilliant red, and make one of the richest of autumnal effects.' (Bean, ii, 307.)

Q. CERRIS[4] *L.* (Turkey Oak).

Buds with long filamentous scales, persistent after elongation of the shoots. *Leaves* narrow, with acute

[1] *ruber, -ra, -rum,* red.
[2] *paluster, -ris, -re,* growing in marshy places (the masculine *palustris* is found in Columella and was used by Linnaeus).
[3] *coccineus, -a, -um,* scarlet.
[4] *cerris,* from *cerrus,* name of a kind of oak.

lobes. *Cupules* densely beset with spreading and reflexed filamentous scales.

Native of parts of central and southern Europe and Asia Minor; naturalized in several districts of England. Easily recognized by its narrow, deeply lobed, dark-green leaves, the lower surfaces of which are covered with multiple hairs, and by the persistent, filamentous stipules, which surround the buds.

***Evergreen.*

Q. ILEX[1] *L.* (Holm Oak, Evergreen Oak).

Tree. *Bark* scaling in thick, often quadrangular flakes, not corky. *Leaves* glossy above, tomentose beneath. *Cupules* whitish. *Acorns* deep chestnut brown, tapering, pointed.

Native and characteristic of the Mediterranean region; common in English gardens; almost naturalized in the south-western counties. It often has several trunks. The leaves are exceedingly variable; their outline is usually ovate or approaches ovate-lanceolate; the margins are flat or recurved; those of suckers and young plants are often spinous-toothed and holly-like, but they are always tomentose beneath (cf. *Q. coccifera*).

This species is the *Ilex* of the Romans, and is the most majestic broad-leaved evergreen tree grown in this country. There are magnificent specimens at Kew. The bark yields no cork, but is rich in tannin; the timber

[1] *īlex*, the name of this tree.

procumbunt piceae, sonat icta securibus ilex
(Virg. *Aen.* vi, 180).

The pitch-yielding trees lie prostrate, and the ilex rings to the stroke of the axe.

is as hard and durable as that of our own Oaks, and the acorns are as good for pigs.

The closely allied *Q. ballota*[1] DC., native of Spain and N. Africa, has large edible acorns.

Q. SUBER[2] *L.*, the Cork Oak of the Mediterranean region, is closely allied to *Q. ilex*, differing chiefly in its whitish very thick bark composed of uniform layers of pure cork, from which bottle-corks are made. In its native land the bark is stripped every eight or ten years. In this country, where the cork is allowed to remain on the tree, it becomes enormously thick and rugose in old specimens.

×Q. LUCOMBEANA[3] *Sweet* (Lucombe Oak) is the name given to the progeny of a hybrid between *Q. suber* and *Q. cerris*. These trees, which vary widely, are commonly planted in the west of England. Some approach *Q. suber*, having corky bark and evergreen leaves; others in their bark and in their deciduous foliage resemble *Q. cerris*.

Q. COCCIFERA[4] *L.* (Kermes Oak, Grain Tree), of the Mediterranean region, where it abounds on limestone rocks, is usually a low shrub with spinous leaves, sometimes described as 'a holly bearing

[1] *ballota*, from Arabic *ballūt*, an acorn. The Labiate genus *Ballōta* is from *βαλλωτή*. [2] *sūber*, the name of this tree.
[3] *Lucombeānus*, *-a*, *-um*, of Lucombe, in whose nursery near Exeter the hybrid arose.
[4] *cocciferus*, *-a*, *-um*, berry-bearing (here refers to the *coccum*, as the *Kermes* was called).

acorns'. It can be distinguished from suckers of *Q. ilex* by the leaves being glabrous on both surfaces. In the eastern Mediterranean there is an arboreal form. This species is the host plant of the insect *Kermes vermilio*, the females of which, when dried, make the red dye called Kermes or Grain.

CASTANEA[1]

Deciduous trees. *Buds* distichous, showing only two scales. *Leaves* simple, serrate, with the lateral veins conspicuous and parallel. *Species* 3–4, N. Temperate.

C. SATIVA[2] *Miller* (Sweet Chestnut, Spanish Chestnut)
PLATE XI

Bark fissured; *fissures* twisted at base of trunk. *Buds* obtuse, two-scaled. *Leaves* large, lanceolate, coarsely serrate, acute.

Native range uncertain. It is extensively planted on account of its fruit, which is an important article of diet in many countries, especially Spain and Portugal. In the Mediterranean region the zone of Chestnuts above the evergreen, sclerophyllous vegetation is well known. It has been much planted in the south of England, especially in Kent, where it is coppiced for hop-poles. Magnificent specimens grow in some of our parks. The Sweet Chestnut avoids limestone soils.

[1] *castanea*, Chestnut.
castaneae molles et pressi copia lactis (Virg. *E.* i, 81).
Mealy chestnuts and cheeses galore.

[2] *satīvus, -a, -um*, sown, planted, cultivated (opp. *agrestis, silvestris*).

FAMILY ULMACEAE

Trees or shrubs without latex. *Leaves* alternate, often distichous, usually oblique at the base, stipulate. *Flowers* in dense axillary cymes or solitary, usually unisexual (rarely all hermaphrodite, as in *Ulmus*). *Tepals* usually 4–5, bract-like. *Stamens* as many as the tepals and opposite them, rarely twice as many; *filaments* straight in bud. *Ovary* usually unilocular, with one anatropous ovule pendulous from the apex; *styles* 2, linear, stigmatic on their inner surfaces. *Fruit* a nut or drupe; *seeds* usually without endosperm.

Thirteen genera and about 120 species, widely distributed in temperate and tropical regions.

Sub-family ULMOIDEAE.

Bark fissured. Fruit a nut, often winged.

Fruit broadly winged . . . . *Ulmus*

Sub-family CELTIDOIDEAE.

Bark not fissured, usually smooth and grey. Fruit a drupe.

Tepals free or nearly so. Style apical . *Celtis*

Tepals united below. Style eccentric *Zelkova*

CASTANEA SATIVA Miller, Spanish Chestnut, Sweet Chestnut (p. 43). Note the lofty massive trunk with almost horizontal branches and zigzag effect. (Cf. *Quercus robur*, Plate X.)

ULMUS NITENS Moench, smooth-leaved Elm (p. 46). Note the slender boughs and fine pendulous spray, in which this species differs widely from *U. campestris*. The foliage is pale green ; that of *U. campestris* is dark green.

Ulmus[1] (Elm)

Trees with dark, rugose bark. *Leaves* distichous, usually scabrous, more or less oblique at the base (*base* often equal in *U. minor*). *Flowers* in dense fascicles, hermaphrodite, produced in our species in early spring on the naked twigs. *Fruit* a disc-like, membranous, one-seeded samara, notched at the end. *Species* about 20, North Temperate region.

The Elms of England, with the exception of *U. glabra*, which is a well-characterized woodland species, are difficult to classify, and their origin and status are obscure. The following so-called species must be distinguished in order to understand the English landscapes. They are, however, all connected by intermediates, some of which are certainly hybrids.

The 'English Elm', known in this country as *U. campestris*, which dominates the landscapes of the alluvial river valleys and clay plains of much of the midland, western, and southern portions of England, is unknown on the Continent. The 'Smooth-leaved Elm' (*U. nitens*), which is characteristic of the landscape of our eastern counties, is the common European Elm. It is the *U. campestris* of continental Floras, which treat *U. minor* as a variety of it.

[1] *ulmus*, Elm.

viminibus salices, fecundae frondibus ulmi,
at myrtus validis hastilibus et bona bello
cornus (Virg. *G.* ii, 446–8.)

The willow's wealth is in her osiers, the elm's in her leaves, but the myrtle and the war-like cornel abound in stout spear shafts.

The leaves described are those on ordinary shoots; those formed on suckers, adventitious shoots, and summer shoots differ widely. Elm twigs are often suberose, and plants bearing such twigs are often described as belonging to the variety *suberosa*.[1]

**Mature leaves glabrous or nearly so, usually less than 9 cm. long, twice or thrice as long as broad. Seed between centre and apex of obovate fruit. Suckers abundant.* (U. foliacea[2] *Gilib.*)

U. nitens[3] *Moench* (Smooth-leaved Elm). PLATE XII *Branches* long, spreading or ascending, often pendulous at the extremities. *Leaves* long-petioled, light green, glabrous, and shining, very oblique at the flat base. (*U. glabra* Miller, 1768.)

Native of Europe, N. Africa, and parts of Asia. In Britain it is characteristic of the eastern counties; it is the commonest hedge-row tree in Cambridgeshire. Easily known at a distance by its fine pendulous spray. The habit varies with the locality. Var. *sowerbyi* has smaller acute leaves. The commonest European form approaches var. *sowerbyi*, but the leaf-bases are usually less oblique than with us. *Var. hunnybunii* has narrower acuminate leaves remarkably oblique at the base.

U. stricta[4] *Lindley* (Cornish Elm).

Branches short, fastigiate. *Leaves* short-petioled;

[1] *sūberōsus, -a, -um*, with cork proliferating so as to form wings.
[2] *foliāceus, -a, -um*, leafy.
[3] *nitens*, shining (*nītèns*, striving).
[4] *strictus, -a, -um*, drawn together, narrow.

blades bent inwards on midrib causing a hollow at the base, which is less oblique than in *U. nitens*.

Native land unknown. A hedge-row tree in parts of Cornwall, Devonshire, and Brittany. Often planted in gardens and parks. It is easily recognized by its narrow outline, which approaches that of the Lombardy Poplar. *U. sarniensis*[1] (*U. stricta* var. *wheatleyi*), the Jersey or Guernsey Elm, differs in its wider angle of branching, broader leaves, earlier flowers, and larger strongly notched fruit.

U. minor[2] *Miller* (Small-leaved Elm).
Branches short, lower ones spreading, upper ones ascending; twigs interlacing. *Leaves* short-petioled; *blades* small, often less than 4 cm. long, slightly hairy above; *base* even or slightly oblique. (*U. sativa*[3] Miller, sec. Moss; *U. plotii* Druce.)

Native of parts of Europe and western Asia. It occurs locally in southern England, and is fairly common in the eastern counties; it occurs in the Cambridgeshire woods on calcareous boulder-clay. Easily known by its interlacing twigs and small leaves, many of which have even bases. Called in the eastern counties 'Lock Elm' because the hard wood impedes and embarrasses the saw.

[1] *sarniensis, -e,* of Guernsey (Lat. *Sarnia*).
[2] *minor, -us,* less, smaller.
[3] *sativus, -a, -um,* sown, planted, cultivated (opp. *agrestis, silvestris*).

****Mature leaves hispid above, about 6–8 cm. in length, and often nearly as broad as long, very dark green. Seed between centre and apex of orbicular fruit. Suckers abundant.**

U. campestris[1] *L.* partim (English Elm). PLATE XIII

Lofty tree with long straight trunk and spreading bulky branches, which end in dense masses of foliage. *Leaves* rather long-petioled; *laminae* dark green, markedly oblique at the base.

Unknown as a native tree outside England, where it is abundant in hedgerows in the southern and midland counties, giving a characteristic aspect to the scenery. In the eastern counties *U. nitens* and *U. sativa* take its place. Easily known by its habit and dark, rough leaves. It is said to have been introduced by the Romans, but the Italian Elm, var. *australis*[2] Henry, is a distinct plant. The English Elm grows from suckers, which it produces copiously, and like many plants that propagate actively underground never bears fertile seeds. The *U. campestris* of continental Floras is for the most part *U. nitens*.

*****Leaves when young more or less hispid above, exceeding 10 cm. in length, and about half as broad as long.** (U. glabra and its hybrids.)

†Leaves subsessile.

U. glabra[3] *Hudson* 1762 (Wych Elm). PLATE XIV

Suckers usually absent. *Branches* spreading and

[1] *campester, -tris, -tre,* growing on plains or in fields.
[2] *australis, -e,* southern.
[3] *glaber, -ra, -rum,* without hairs, smooth.

ULMUS CAMPESTRIS L., English Elm (p. 48). Note the lofty trunk with massive arching boughs ascending towards the extremity, and rounded crown.

ULMUS GLABRA Hudson, Wych Elm (p. 48). Note the dome-like crown with arching branches, much wider and with much less lofty bole than in the English Elm.

descending, forming a dome-like crown; *twigs* never suberose. *Leaves* obovate, very scabrous above and softly hairy beneath; *base* very asymmetrical. *Seed* in the middle of the fruit. (*U. montana*[1] With. 1787, the best-known name.)

Native of Europe and of parts of temperate Asia. It is widely distributed in Britain, but commonest in the west and north. Known by its large, very rough, obovate leaf, whose short petiole is usually concealed by the base of one side of the lamina. The lamina often ends in three cusps.

Since this species has the roughest leaves of all our elms, Hudson's designation *glabra* is unfortunate. This name does not refer, however, to the leaves, but to the bark of the twigs, which remains smooth after the second year. In obedience to the law of priority at present in force, the name *U. glabra* is, unhappily, the only valid one for this plant.

††*Leaves distinctly petioled.*

×U. HOLLANDICA[2] *Miller* (Dutch Elm). PLATE XV

Suckers very abundant, often suberose. *Branches* wide-spreading, upper ones ascending. *Petioles* up to 1 cm. long. *Lamina* broadest at the middle or slightly below it, hairy when young, glabrescent; *ribs* 10–14 pairs. *Seed* usually reaching notch of fruit. (*U. major*[3] Smith.)

[1] *montānus, -a, -um*, growing on mountains.
[2] *hollandicus, -a, -um*, Dutch.
[3] *mājor, -us*, greater.

A hybrid between *U. nitens* and *U. glabra*. From *U. nitens*, which it resembles more closely, it is distinguished by its larger leaves, and fruit, and by the vast swarm of suckers that surround its base. It is often seen by roadsides, where the suckers not only form the hedge, but encroach as far as they are allowed on to the road.

×U. VEGETA[1] *Schneider* (Huntingdon Elm). PLATE XVI

Suckers usually absent. *Branches* ascending at a narrow angle (about 30°) from a rather short bole. *Petiole* often exceeding 1 cm. *Lamina* broadest slightly beyond the middle, very oblique at base, rough when young, smooth and shining above when mature; ribs 14–18 pairs. *Seed* between centre of fruit and notch.

A hybrid with the same parents as *U. hollandica*, from which its ascending branches at once distinguish it. The leaves somewhat resemble those of *U. glabra*, but they are usually smaller and narrower and their upper surfaces are ultimately smooth and shining. The ascending branches make this tree suitable for planting in streets, and it is becoming increasingly common in our towns. Other hedgerow elms resemble hybrids with the above parentage, but defy classification.

The continental *U. effusa*[2] Willd. (*U. pedunculata*[3] Fougeroux) differs from our elms in its paler, partially flaking bark, in its flowers being borne on filiform pedicels, and in its ciliate fruits. The leaves resemble

[1] *vegetus, -a, -um*, vigorous.
[2] *effūsus, -a, -um*, spreading, straggling.
[3] *pedunculātus, -a, -um*, stalked.

×ULMUS HOLLANDICA Miller, Dutch Elm (p. 49). The spreading branches and abundant suckers render this elm unsuitable for planting in streets.

×ULMUS VEGETA Schneider, Huntingdon Elm (p. 50). There are no suckers and the branches ascend at an angle of about 30° to the trunk, whence this elm is a favourite street tree.

those of *U. nitens*, but are more acuminate, and broadest at (not below) the middle. All the ribs usually reach the leaf-margin unbranched. Forked ribs, like those of our elms, are rarely seen in this species.

Of the sub-family CELTIDOIDEAE the following are noteworthy:

CELTIS AUSTRALIS[1] *L.* Native of the Mediterranean region. A grey-barked, round-headed tree with lanceolate or ovate, acuminate leaves, solitary axillary flowers, and black edible drupes. It is barely hardy in Britain. The wood is hard and durable, and the young shoots make the best whip-handles.

C. OCCIDENTALIS[2] *L.* Native of eastern North America. A grey-barked, broad-headed tree with ovate leaves, 1–3 flowered axillary cymes, and dark red drupes. It is hardy in England and sometimes seen in our gardens.

ZELKOVA CRENATA[3] *Spach.* Native of the Caucasus Region. A tree with scaling, rusty bark and a remarkably dense head of ascending branches resembling an immense broom. Leaves elliptic, coarsely crenate-serrate. There are large specimens of this tree in Britain.

[1] *austrālis, -e,* southern.
[2] *occidentālis, -e,* western.
[3] *crenātus, -a, -um,* crenate.

FAMILY MORACEAE

Trees or shrubs with usually abundant latex. *Leaves* alternate, stipulate. *Flowers* unisexual in cymose inflorescences, which, by thickening and union of axes, often become heads, false spikes, or disks, or sometimes globular and hollow with the flowers lining the interior. *Tepals* usually 4. *Stamens* usually of the same number as, and opposite, the tepals. *Ovary* unilocular with one pendulous ovule. *Fruit* a small nut or drupe often enclosed in the persistent, fleshy perianth and embedded in the complicated infructescence; *seeds* with or without endosperm.

Fifty-five genera and 950 species, nearly all natives of the tropics. They are closely allied to the other families of *Urticales*, from which, however, they can usually be readily distinguished by their milky juice.

SUB-FAMILY MOROIDEAE.

Leaves folded in bud; *stipules* small. *Stamens* at first bent inwards.

Leaf-margins crenate-serrate. Inflorescence catkin-like . . . . . *Morus*

SUB-FAMILY **ARTOCARPOIDEAE.**

Leaves convolute in bud; *stipules* large, amplexicaul, caducous. *Stamens* straight.

Leaf-margins entire. Inflorescence a fleshy bag with the flowers inside . . . . *Ficus*

MORUS[1] (Mulberry)

Trees. *Leaves* often of diverse form on the same branch owing to irregular lobing; *stipules* small. *Flowers* in unisexual, catkin-like spikes, the staminate soon falling, the carpellary growing into blackberry-like infructescences in which the succulent portion is composed of the perianths of the individual flowers. *Species* 10, North Temperate.

M. NIGRA[2] *L.* (Common Mulberry).

A rugged tree with irregularly fissured bark and crooked branches. *Leaves* ovate, with deeply cordate base, coarsely serrate, sometimes lobed, dark green and rough above, softly hairy on the nerves beneath. '*Mulberries*' dark red, borne on short peduncles.

Native of Persia; long cultivated in many countries for its infructescences, which are called 'mulberries'. Specimens with historic associations abound in England. Silk-worms will eat the leaves of this species when *M. alba* is not available.

[1] *mōrus*, Mulberry-tree.
sanguineis frontem moris et tempora pingit (Virg. *E.* vi, 22). She paints his forehead and brows with dark mulberries.

[2] *niger, -ra, -rum*, black.

M. ALBA[1] *L.* (White Mulberry).

Leaves smooth, shining, nearly glabrous, truncate or faintly cordate at the base. '*Mulberries*' white or pinkish, about as long as their peduncles.

Native of China; long cultivated in the Mediterranean region, &c., for the leaves, on which silk-worms are fed. Not often seen in this country outside Botanic Gardens.

FICUS[2]

Woody plants of diverse habit. *Bark* of trees usually smooth and grey. *Flowers* on the inner surface of a fruit-like receptacle, which has a small opening at the end. *Species* about 600, almost all tropical. Some have buttress roots. Some begin life as epiphytes, but their roots on reaching the ground thicken to form huge pillars. The 'host' is soon destroyed, and the fig continues to send down roots, which thickening into pillar-like trunks may eventually form an immense grove.

F. CARICA[3] *L.* (Common Fig).

Shrub (in Britain). *Leaves* large, 3–5 lobed, dark green above, softly hairy on the veins beneath, margin undulate.

Probably native of west Asia; cultivated in the Mediterranean region for countless centuries. In the milder

[1] *albus, -a, -um,* white.
[2] *ficus,* Fig-tree.
[3] *cāricus, -a, -um,* of Caria, a province in Asia Minor.

districts of England it bears edible fruit when grown against walls. The cultivated tree (var. *domestica*[1]) has no staminate flowers, and with us ripens its fruits parthenogenetically. In the south it is fertilized from wild plants (var. *caprificus*[2]) which have staminate and gall flowers but no functional carpellary flowers.

[1] *domesticus, -a, -um,* belonging to the house.
[2] *caprificus* (lit. goat-fig), the name of this wild fig.

FAMILY URTICACEAE

Herbs, rarely shrubs or trees, sometimes with stinging hairs. *Leaves* opposite or alternate. *Flowers* usually unisexual. *Perianth* 4-partite or 4-toothed. *Stamens* 4, opposite the perianth lobes; *filaments* bent inwards in bud, ultimately straightening elastically to scatter the pollen. *Ovary* unilocular with one basal ovule. *Fruit* an achene or drupe, often enclosed within the persistent perianth.

Forty-one genera and about 550 species. The *Urticaceae* are poorly represented outside the tropics, though the genus *Urtica* extends into both arctic (*U. urens*) and antarctic (*U. australis*) regions. The most widely distributed member of this family is *Parietaria debilis*[1] Forst. which extends from Siberia to Tasmania and New Zealand and from North America to the Argentine.

Stinging hairs present. Leaves opposite, stipulate *Urtica*

Stinging hairs absent. Leaves alternate, exstipulate . . . . . *Parietaria*

Urtica[2]

Herbs with stinging hairs. *Leaves* opposite, stipulate. *Flowers* monoecious or dioecious in catkins or heads.

[1] *dēbilis, -e,* feeble. [2] *urtīca,* Nettle.

Perianth 4-partite, in the staminate flowers concave, in the carpellary flat. *Fruit* a compressed achene. *Species* 30, temperate regions.

U. urens *L.*

Annual, glabrous except for the stinging hairs. *Flowers* of both sexes in the same catkin.

Native of Europe, Asia, and north Africa. Common in waste places throughout Britain. Seldom found far from human habitation. More venomous than *U. dioica*.

U. dioica[1] *L.*

Perennial, hairy, dioecious. *Flowers* in catkins.

Native of Europe, Asia, and north Africa. Common in waste places, damp woods, &c. throughout Britain. It is nitrophilous, but not so strictly ruderal as *U. urens*. The nettle was formerly cultivated for its fibre. The young tops are sometimes cooked and eaten.

U. PILULIFERA[2] *L.*

Annual, monoecious. *Carpellary flowers* in globose heads.

Native of the Mediterranean region. A rare alien in Britain. Very venomous.

Parietaria[3] (Pellitory)

Leaves alternate, entire, exstipulate. *Flowers* in

[1] *dioicus, -a, -um*, dioecious.
[2] *piluliferus, -a, -um*, bearing little balls or pills (referring to the globose carpellary inflorescences).
[3] *parietāria*, name of a herb growing on walls (*paries, -etis*, a wall).

axillary cymes, polygamous. *Perianth* of staminate and hermaphrodite flowers tubular, 4-partite; of carpellary flowers tubular, 4-toothed.

P. officinalis[1] *L.*

Perennial. *Leaves* 3-nerved, shining above; *base* cuneate.

Grows in Europe, north Africa, and west Asia; probably originally Mediterranean. It occurs throughout the British Isles, preferring calcareous soils, and is most commonly seen growing in the mortar of old walls. Formerly cultivated as a medicinal plant.

[1] *officīnālis, -e*, officinal, available in drug shops.

FAMILY CANNABACEAE

Aromatic herbs devoid of latex. *Leaves* usually opposite, palmately nerved and palmately lobed or divided; *stipules* persistent. *Flowers* dioecious. *Staminate flowers* in large, lax inflorescences; *tepals* 5; *stamens* 5, opposite the tepals. *Carpellary flowers* in spike-like or cone-like inflorescences; *perianth* entire or split on one side, persistent; *carpels* 2; *ovary* unilocular, with one ovule; *styles* 2. *Fruit* an achene; *seeds* with fleshy endosperm.

Two genera and 3 species native of the North Temperate regions. Engler makes this group the sub-family *Cannaboideae* of the family *Moraceae*.

Perennial twiners. Leaves palmately lobed. Infructescence peduncled, cone-like . *Humulus*

Stem erect, leaves palmate. Infructescence sessile *Cannabis*

Humulus[1]

Left-handed twiners with handsome, cordate, vine-like leaves and connate stipules. *Carpellary catkins* compound, with outer bracts which remain small,

[1] *hūmulus*, hop.

and inner ones which enlarge and become orbicular and imbricate. *Species* 2, North Temperate Zone.

H. lupulus[1] *L.* (Common Hop).

Perennial, aromatic. *Stems* very scabrid. *Leaves* large, petioled, uppermost ovate, the rest lobed to the middle. *Infructescence* enlarging to form 'hops'.

Native of the North Temperate region of the Old World, including the south of England. The part used in brewing is the infructescence, which is covered with yellow, resinous glands containing the bitter, aromatic principle lupulin. In former British Pharmacopeias the infructescences were official under the name of 'Lupulus', but they were omitted in 1914. The young, blanched shoots can be eaten like celery. See Lindley, *Treasury of Botany*, i. 601.

H. JAPONICUS[2] *Sieb. et Zucc.*

Annual, devoid of glands and hence not aromatic. *Leaves* smaller and more deeply lobed. *Infructescence* not enlarging.

Native of China and Japan. Occasionally cultivated as a creeper.

CANNABIS[3]

Erect annual herbs. *Leaves* with about seven narrow segments. *Carpellary inflorescences* leafy, sessile, condensed. One species.

[1] *lūpulus*, hop.
[2] *japonicus, -a, -um*, Japanese.
[3] *cannabis*, hemp.

C. SATIVA[1] *L.* (Hemp).

Stem erect, branched, hairy: leaves mostly opposite; *segments* narrow serrate.

Probably native of Asia. Cultivated in many countries for the fibre and seeds, grown in India it yields an intoxicating resin; in temperate climates it is pharmacologically inert.

[1] *satīvus, -a, um,* cultivated.

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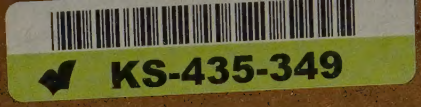
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